Subject Description Form

Subject Code	FSN3418 (ABCT3418)
Subject Title	Food Engineering and Processing I
Credit Value	3
Level	3
Pre-requisites	University Physics I (AP10008) or Physics I (AP10005) or Physics for Chemical and Biological Sciences (AP10011)
Co-requisites	Calculus and Linear Algebra (AMA1007); Food Engineering and Processing I Laboratory (FSN3419 / ABCT3419)
Exclusion	Nil
Objectives	This subject aims to introduce the fundamental principles of food engineering and processing, with an emphasis on the quantification and analysis of processing conditions, material and energy balances, heat transfer and fluid flow.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a) Describe the common food manufacturing processes and the functions of major processing units; b) Formulate mass and energy balances for common food manufacturing processes; c) Define the principles of food engineering (thermodynamics, heat transfer and fluid flow); d) Demonstrate improved logical thinking and problem-solving skills.
Subject Synopsis/ Indicative Syllabus	Introduction of Food Manufacturing Processes: The composition and layout of common food manufacturing processes starting from pretreatment of raw food materials to packaging and preservation of food products. Engineering Terms and Measurements: Dimension and units; Process variables: temperature, pressure, and flow rate; Material properties: mixture composition, air humidity and solid moisture, ideal gas law, multiple phase systems and equilibrium relationships. Material Balances: Laws of mass and energy conservation; material balances for single- and multiple-unit systems as well as mixing and separation processes. Energy Balances: Thermodynamic concepts and properties for food processing; energy terms, enthalpy changes and states of water; energy balances and heat exchange. Fluid Properties and Flow: Basic characteristics of fluids: hydrostatic pressure,

fluid viscosity and non-Newtonian fluid rheology, laminar and turbulent flow; fluid flow energy balances, friction losses.

Principles of Heat Transfer: Basic means of heat transfer: conduction, convection and radiation; heat transfer in solids and fluids; heat transfer coefficients; common heat-transfer equipment (heat exchangers); heat transfer and energy balances in evaporation.

Evaporation Process and Concentration of Food Products
Evaporator structures and operations, single and multiple effect evaporation; Major process factors affecting the rate of evaporation; Evaporation for food processing: effects on food quality and effective measures for avoiding food quality losses.

Teaching/Learning Methodology

Lectures: to introduce the essential contents, to elaborate the major principles, concepts and equations. Practical examples and problems in food processing will be used to illustrate the principles.

Tutorials: to give further explanation and illustration of the major and relatively difficult contents, to apply the concepts and principles in problems and exercises, and to engage the students in more interactive and effective discussion of problem cases.

After class: homework assignments and exercises will be given to students. **On- line resources:** a subject web will be set up and used as a teaching aid. **Detail answers/solution manuals** are provided to the students for most of the assignments.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
		a	b	c	d
1. Final exam	50	√	√	√	√
2. Course work	50	√	√	√	√
Total	100 %				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Learning outcomes will be assessed continuously through written assignments, quizzes and tests. The connection of these assessments to the learning outcomes will be stated explicitly to the students.

Student Study Effort Expected

Class contact:	
▪ Lectures	26 Hrs.
▪ Tutorials	13 Hrs.
Other student study effort:	
▪ Self-study	52 Hrs.
▪ Assignments	32 Hrs.
Total student study effort	123 Hrs.

Reading List and References	Essential 1. Toledo RT, Singh R, Kong F: Fundamentals of Food Process Engineering, 4th ed. Springer, 2018. 2. Singh RP, Heldman DR: Introduction to Food Engineering 4th Ed. Academic Press, 2009. Supplementary 3. Geankoplis C J: Transport Processes and Separation Process Principles, Prentice Hall 2003. 4. Felder R M & Rousseau RW: Elementary Principles of Chemical Processes, John Wiley & Sons 2017.